# The Planters' Chronicle.

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## THE U. P. A. S. I.

(INCORPORATED.)

### Contents.

Mr. Anstead, Scientific Officer, has returned from his tour looking all the better for his trip to the High Range.

The Coorg Planters' Association is to be congratulated in that the Government of India are contributing to the Scientific Assistant Officer Fund, thereby recognising the importance of Science, initiated by the Mysore and Coorg Planters.

Portions of an interesting lecture by Dr. Chandler on the importance of caffein in Tea are a summary on experiments on the Tackiness of Rubber is reproduced.

A valuable paper on coffee by Messrs. Tattock and Thomand should prove of interest to Coffee Planters in Southern India, especially the table which accompanies it, comparing as it does, Costa Rica, Mysore, East India and Mocha coffees.

The sharp fall in coffee prices is attributable to political and financial unrest, a London Coffee Return to February 15th is published.

For those who send cuttings over long distances a simple method for preserving them is produced and should be made use of.

An interesting article on Chlorosis in Plants is reproduced.

With the use of explosives as an aid to agriculture becoming so prominent, an article on Dynamite in Tea Planting should prove of interest.

As Basic Slag is so much used a paper on its solubility by John Hughes F.I.C., is printed as interesting.

Mr. Guy Owen of Messrs, Sanderson & Co., has written to say that he is very pleased to accept the appointment of Representative of the United Planters' Association of Southern India at the Chamber of Commerce.

Mr. Sanderson writes to the Secretary as follows :—

"Please convey to the Association my thanks for their very courteous expression of my past services and assure them it has been a great pleasure and honour to represent them on the Chamber during the past (about) 25 years."

## DISTRICT PLANTERS' ASSOCIATIONS.

### Coorg Planters' Association.

*Proceedings of a Meeting held in the Bamboo Club, Follibetta, on Thursday, March 20th, 1913.*

PRESENT.—Messrs. Breithaupt, Garrett, Newberry, Mahon, Shaw, Gerrard, Pechell, Hume, W. R. Wright, Macrae, Bracken, C. E. Murray-Ansley, (President) and W. M. Ball, (Honorary Secretary).

The Honorary Secretary read the notice calling the Meeting and, for the information of those who had not already seen it, the note on "Railway Communication with Coorg" kindly forwarded by Sir Hugh Daly, K.C.I.E., C.S.I., Chief Commissioner of Coorg. Mr. Ball proposed and Mr. Mahon seconded a hearty vote of thanks to the Chief Commissioner for the interest he has shown in this matter of Railways in Coorg.—Carried *nem. con.*

Proposed by Mr. Bracken and seconded by Mr. Wright "That a Sub-Committee consisting of Messrs. Garrett, Mahon, and Macrae with the President and the Honoraray Secretary be appointed to collect such statistics as may be of use to Mr. E. A. S. Bell, Chief Engineer for Railway Construction to the Mysore Durbar.—Carried.

Proposed by Mr. Ball seconded by Mr. Garrett "That a Sub-Committee of the following be formed for the purpose of revising the rules of the Association and to report at the Annual Meeting, Messrs. Shaw, Hume and Gerrard.—Carried.

Mr. Breithaupt brought up the subject of the Polibetta Post Office being reduced to a 3rd class.

Resolved "That a further protest be made."

Read letter from the Commissioner of Coorg in answer to the Honorary Secretary's letter of the 14th February saying "that intimation of outbreaks of plague or other epidemics will be given to you and to all Superintendents of Estates in the immediate neighbourhood of the outbreak, and that Arrack and Toddy shops in the localities affected are, as a rule, closed for such a period as is considered desirable."—Noted with thanks.

Read letter from the Commissioner of Coorg saying "That the Government of India have been pleased to sanction an annual grant of Rs.1,500 for a period of 5 years to the Scientific Officer's Assistant Fund."

Resolved "That the hearty thanks of the Association be given to the Chief Commissioner and the Commissioner of Coorg for the interest they have shown and the trouble they have taken in this matter and that the Commissioner be asked to convey the thanks of the Association to the Government of India."

Messrs. G. A. Parsons and H. Hammond were elected members of the Association.

(Signed) W. M. BALL.

*Honorary Secretary.*

## TEA.

### The Market Points of Tea.

THE IMPORTANCE OF CAFFEINE.

Dr. Chandler's lecture on the Economics of the Tea Trade at the London School of Economic and Political Science, on Tuesday last, dealt with many points important to the planter and to the dealer, and, of course, ultimately to the public. Referring to the manuring of the tea estate he pointed out that the increases in the products of estates consequent upon manuring did not, of course, represent always equivalent additional profits, because the cost of the manures and their application had to be taken into account. In the practice of green manuring, certain biological processes had been taken advantage of by planters which were well-known in regard to other crops. All these facts pointed to the conclusion that thorough methods of manuring resulted in greatly improved crops, which meant an accompanying, but not necessarily proportionate, increased monetary return. With regard to the manufacture of tea, he pointed out that no methods of manufacture would make a high-grade tea from a low-grade leaf but bad methods of manufacture would spoil a good leaf. The leading market points upon which the quality of a tea liquor was judged were: Flavour, pungency, colour, and body. Flavour resulted from the presence in exceedingly small quantities of an essential oil, the product of fermentation. Pungency was caused in the greatest measure by the unfermented (unoxidised) tannin present. Colour was chiefly caused by fermented (oxidised) tannin. Body depended principally upon the total soluble matter, which could be extracted and made up in larger part of the tannin, fermented and *unfermented*.

Dr. Chandler then remarked that two facts stood out strongly in regard to these "market points." One was the importance of the much abused tannin. The tea expert regarded as the finest teas, and priced them accordingly, those which contained the highest percentage of tannin. An analysis of a common Ceylon tea showed tannin present 5·40 per cent. in the cup, while in high priced Ceylon tea there was present 7·50 per cent. It would be seen from the tannin relationships of pungency and colour that a vital point in tea manufacture would be how far the fermentation of the tannin was to be allowed to go. If the oxidisation were carried to completion or excess pungency would suffer, and if not carried far enough the colour would be at fault. It was always a question, and a matter of experience, how far pungency was to be sacrificed to colour. The second point was the absence of any reference to caffeine. It was to this substance, which was a poisonous alkaloid, present also in coffee, cola, and, in small quantities, in cocoa, etc., that the stimulating effect of tea was due. It was the most important medicinal constituent; but, curiously enough, the tea expert took no conscious account whatever of the caffeine-content when judging the value of a tea, and the prices of two samples of tea would have little or no relation to a caffeine-content. It was true that the highest-priced teas were, in general, from the youngest leaves contained much more caffeine than much older leaves; but these teas were selected for character other than caffeine-content. Personally, he had always suspected something of a vicious circle in this contention, and recent researches by the "Lancet" indicated a most interesting relationship between caffeine and tanning as factors influencing tea prices.—*The Rubber World.*

## RUBBER.

### Tackiness of Rubber.

Some useful experiments dealing with tackiness carried out by Mr. K. Gorter, and published in "Mededeelingenover Rubber" Java, are admirably summarised by the *Bulletin* of the Imperial Institute, as follows:—"He (K. Gorter) points out that the best qualities of Hevea rubber show little tendency to become tacky. He criticises the view that bacteria cause tackiness on the grounds that: (1) It is not infectious, at any rate the infection proceeds very slowly and is incapable of detection; (2) rubbers coagulated in presence of antiseptics or by boiling are just as likely to become tacky as rubber prepared in other ways; (3) light, which is generally inimical to bacterial action, favours tackiness. He admits, however, that substances produced by bacteria may bring about tackiness, acids, such as sulphuric, being known to favour the change. Gorter finds that prolonged heat at 60 C. may cause rubber to become tacky, and that rubber which had been dissolved in benzene and re-precipitated is liable to the same change. He found that a solution of rubber in benzene diminished rapidly in viscosity on exposure to strong sunlight, whereas in the dark it remained fairly constant. By evaporation of the solution of rubber which had been exposed to light, a residue was obtained which had all the properties of tacky rubber. He concludes that the tackiness of rubber is due to a physical change such as the change from amorphous to crystalline tin. On continuing his experiments, however, (Mededeeling No. 2), he found that rubber solutions exposed to the light eventually deposited a gelatinous precipitate. This precipitate, after washing by decantation, gave a yellow colouration with a titanium sulphate and liberated iodine from potassium iodide, but on shaking with an ethereal solution of chromic acid no blue colour was produced in the either layer. He, therefore, concludes that an organic peroxide is formed, and elementary analysis of the precipitate gave results agreeing with the formula $C_{10}H_{16}O_2$. He next exposed rubber to light in atmospheres of air, oxygen, hydrogen, and carbon dioxide, and found that whereas in the last two cases the rubber retained its elasticity, in an atmosphere of air or oxygen it became very tacky, with absorption of 3 per cent. by weight of oxygen. Even the absorption of 0·6 per cent. by weight of oxygen produced considerable stickiness, which he thinks explains why previous observers have failed to notice any increase in weight when rubber became tacky. Carrying out the experiments in an apparatus in which he could measure the rate of absorption of oxygen, he finds that this is at first slow, but becomes more rapid as oxidation proceeds. He thinks from the reactions of the product that levulinic acid is produced when rubber becomes tacky. He concludes finally that tackiness is due to definite conditions favouring oxidation, such as heat, light, and the presence of certain chemical substances. He finds tacky rubbers have a high ash content, and manganese is always present; but seeing that manganese is also present in the ash of the best quality of Hevea rubbers, he thinks that manganese alone is not responsible for tackiness, but may be active in conjunction with other substances. In support of this view he cites the observation of Euler (Zeitsch. f. physiol. Chem. 1908, 57, 80) that the oxidation of hydroquinone by light is greatly accelerated by solutions of Rochelle salt or sodium citrate containing manganese. This view is also in harmony with the apparently universal occurrence of manganese in the ash of oxidases (Bertrand, Bach, and others)."—*The Rubber World.*

## COFFEE.

### There is no Tannin in Coffee.

*Such is the Conclusion of R. R. Tatlock and R. R. Thom, and from Elaborate Analysis of Composition of Coffee.*

It might be thought from the volume of literature on coffee, that the subject had been dealt with sufficiently to serve all purposes for the detection of adulteration in the former article. But when we examine the literature in this connection it is clear that there is something to be done in improving and, if possible, in shortening the methods of analysis, and above all revising and correcting data which are obviously unreliable. It is in this direction that we propose to go in the present paper.

In making analyses of coffee, the data generally relied upon to determine the genuineness, or otherwise, of coffee are the mineral matter soluble and insoluble in water, and the specific gravity of a 10 per cent extract of the sample, or the percentage of extract yielded by boiling a weighed portion of the sample repeatedly with water until exhausted. An item generally omitted is the caffeine, but since the introduction of "coffee freed from caffeine" it seems to be necessary that the percentage of this alkaloid should be determined, as the article referred to cannot be regarded, and is not sold, as genuine coffee, seeing the caffeine has been abstracted, which is certainly not allowed by Section 9 of the Food and Drugs Act, 1875 of United Kingdom.

*Caffeine.*—The methods given in text books for the estimation of this alkaloid are either unreliable or tedeious and elaborate; but the following simple and rapid process, which we devised and have employed for several years, supplies the want. Boil 6 grams of the coffee with 600c.c. of water for two hours, under a reflux condenser, cool, filter of 500c.c. of the solution (equal to 5 grams of the coffee), evaporate the filterate to about 40c.c. in bulk, cool, add 10c.c. of normal caustic soda or ammonia, and transfer to a separator, washing in with as little water as possible, which need not be more than 10c.c. respectively; collect these together in a clean separator and shake up, first with 10c.c. of normal caustic soda, and then with 10c.c. of water, in order to remove all traces of colouring matter, etc. Distill off the chloroform, dry at 100c., and weigh the caffeine. If the caffeine is coloured it may be dissolved in a little dilute caustic soda, and extracted again with chloroform: if the process is carefully carried out this is not necessary.

*Water Extract and Specific Gravity of Extract.*—The methods generally given for the determination of water extract in coffee or tea, and especially in the latter case, do not appear to give consistent results, too much being allowed to depend on chance. The instructions are to boil with repeated quantities of water till coloring matter ceases to come out, but we do not find this method to give quite consistent results, so we can recommend the following as always giving results within less than half a per cent; boil 1 gram of the sample with 400c.c. of water under a reflux condenser for one hour, collect the insoluble matter on a weighed filter, wash two or three times with boiling water, dry at 100 c., and weigh. Traces of oil contained in the coffee may be left in the flask in which the boiling is conducted, and if this is the case it may be dissolved in ether, evaporated, weighed, and added to the insoluble matter contained in the weighed filter. All that now requires to be done is to add together the insoluble in water and the water, and subtract the sum from 100, when the difference will represent the water extract.

In the annexed table we have recorded analyses of well-known varieties of coffee, roasted and unroasted, also of a well-known brand of "coffee freed from caffeine." In addition to the caffeine and water extract, we have also given other data, among which are the specific gravity of a 10 per cent. extract, the ash soluble and insoluble in water, the silica, and the oil extracted by petroleum spirit. These need only be referred to, as they were estimated in the usual way. The dextrose stated in the analyses is simply the copper-reducing power, toward Fehling's solution, of the sample without any preliminary treatment to clarify or decolorize the coffee or chicory solution. The moisture was estimated by drying 5 grams of the sample at 100 c. until no further loss in weight was observed. Two hours generally sufficed for this, but if the heating was prolonged after the maximum loss, the sample began to gain in weight.

ANALYSIS OF COFFEE, PER CENT. IN SAMPLE DRIED AT 100 C.

| | Costa Rica. | | | Mysore. | | East India roasted. | Mocha roasted. | Coffee freed from caffeine. |
|---|---|---|---|---|---|---|---|---|
| | Raw. | Roasted. | Roasted. | Raw. | Roasted. | | | |
| Caffeine ... | 1'22 | 1'20 | 1'38 | 1'18 | 1'25 | 1'46 | 1'19 | 0'08 |
| Water extract ... | 30'80 | 30'26 | 30'77 | 31'02 | 29'06 | 29'10 | 30'76 | 27'42 |
| Ash soluble in water .... | 3'06 | 2'96 | 3'21 | 3'01 | 3'15 | 3'32 | 3'14 | 3'30 |
| Total mineral water, less silica | 3'83 | 3'84 | 4'19 | 5'94 | 4'11 | 4'29 | 3'96 | 4'31 |
| Silica (chiefly) Sand ... | Trace | Trace | Trace | Trace | Trace | Trace | Trace | Trace |
| Oil ... ... | 14'26 | 12'48 | 12'96 | 11'90 | 12'01 | 12'90 | 14'04 | 13'12 |
| Tannin ... | 3'75 | None | None | None | None | None | None | None |
| Specific gravity of 10% extract.. | ... | 1'0102 | 1'0099 | ... | 1'0102 | 1'0101 | 1'0102 | 1'0101 |
| Copper reducing as dextrose ... | ... | '69 | ... | ... | '62 | ... | ... | ... |
| Moisture originally present ... | 8'24 | 5'30 | 2.20 | 10'87 | 6'68 | 3'10 | 5'74 | 1'22 |

Having dealt with the methods employed in testing coffee, we have now to deal with the results of analysis as bearing on the genuineness, or otherwise, of any sample submitted to the analyst, and for this purpose we refer to the table. From our experience, the water extract, taken singly, is the most reliable of all, as the variations observed in different coffees are not so great as shown by any of the other ingredients, so that it gives the best basis for the calculation of percentage of adulteration, once the fact of adulteration has been approved. It may be held that the specific gravity of the 10 per cent. extract gives quite good results, but these are more variable than the water extract, and the former are dependent, to some extent, on the fineness of the particles of the ground coffee, a condition which does not influence the latter method of testing. As a basis of calculation, 30 per cent of water extract in coffee and 75 per cent in chicory, both taken on the sample dried at 100c., may be assumed where admixture with chicory is proved. The further proofs absolutely necessary are the percentage of caffeine and the mineral matter, including the proportions of soluble and insoluble in water, as well as the silica. If, in a sample, the caffeine falls

materially below 1·2 per cent., while the other items just referred to come out practically normal, then the presumption is that the article in question is coffee freed from caffeine, or a mixture of that with genuine coffee. In this case an opinion must be based on the percentage of caffeine found, and the sample may be described as deficient in caffeine, or as coffee from which caffeine has been abstracted, to the extent found. This is the case with what is now advertised as "Lifebelt" coffee, but it will be observed that the water extract is fully 1½ per cent. lower than the lowest of the genuine coffees. Of course, this difference is too small to make one positive that anything has been removed, but the large deficiency in caffeine proves this, and also shows, when the other figures are taken into account, that little more than caffeine has been extracted.

Such, briefly stated, are the conclusions we should arrive at in certain circumstances. It is necessary, however, to deal with recorded results of coffee analyses. In different text books as low as 0·5 per cent. of caffeine is stated to be present in genuine coffee, but we are quite satisfied that this alkaloid does not fall materially below 1·2 per cent. in any coffee. The low results need not be assigned to inaccuracy on the part of the analyst, but probably to the methods of analysis employed, most of which required very careful manipulation to obtain anything like reliable results. So far as our experience goes, the percentage of caffeine in coffee procured in this country (England) lies between 1·19 and 1·46 per cent. on the dry sample. These figures are purposely given in our table, because they are the lowest and highest we have found after making a very large number of analyses. It should be stated, however, that since our results were obtained, Lendrich and Nottbohm have reported as high as 2·95 per cent., of caffeine in roasted African coffee, but the finding of such an exceptional percentage of alkaloid would not point to tampering with the article, supposing the other constituents were in order.

The water extract as stated in our table also gives the lowest and highest found, and it will be observed that the range is very limited. These results are considerably higher than those (from 21·5 to 26·5) per cent generally given, and cannot be accounted for by the mere difference of method of treatment.

The ash soluble and insoluble in water are much as stated by Allen, and the old extracted by petroleum spirit is higher than is generally given (10 to 12 per cent. in coffee and 1 per cent. in chicory).

The only other point to which reference may be made is as to whether coffee contains tannin or not. In one of the most recent books on "Food Analysis" there is an elaborate process given for the determination of tannin in roasted coffee, this being dependent on a 48 hours' fermentation of the coffee after soaking with water, then extraction with alcohol, and final precipitation as tannate of lead in the alcoholic solution. How this distinguishes tannin from coloring matters it is difficult to understand, so that a definition of the former term is required. In our view tannin is a substance which will tan the skin or hide of animals, that is, a body that will be fixed by or combine with the nitrogenous bodies contained in that article, and under the proper conditions should the precipitable by gelatin and certain alkaloids, such as quinine and cinchonine. Now, the so-called tannin or caffetannic acid of roasted coffee has no such properties, so that it cannot be regarded as a real tannin. We have found, however, that unroasted or raw coffee does contain a genuine tannin to the extent of about 4·5 per cent. This was estimated by precipitation with quinine sulphate, a process which we have successfully applied to the estimation of tannin in tea, and which has been corroborated by Lowenthal's volumetric process. From these re-

sults it seems clear that although tannin exists in the raw coffee it is destroyed during the roasting. In the foregoing statement about tannin in roasted coffee, we have the support of Prof. Proctor in his recent book on "Leather Industries," 1908, where he says that "certain bodies (caffetannic acid, etc.) have been described as tannins, but do not precipitate gelatin or tan hide and are more closely related 'to the coloring matters' than the tannin." As far as we are aware, the presence of tannin in the sense which we have described, in raw coffee has not been previously noted.

We append the results of the examination of the fixed oil, that is, oil not volatile at 100 c., extracted from raw and roasted coffee, respectively, as regard some of the constants:—

| | Oil from Raw Coffee. | Oil from Roasted Coffee. |
|---|---|---|
| Iodine value per cent. ... | 99'00 | 99'00 |
| Saponification value per cent. ... | 17'95 | 17'95 |
| *Unsaponifiable matter* ... | 5'26 | 5'31 |
| Specific gravity at 15 c. ... ... | | '9354 |

It will be observed that the constants for the oil contained in roasted and unroasted coffee are practically the same, and that the unsaponifiable matter is higher than that generally found in vegetable oils. The iodine value of the unsaponifiable matter was found to be 171'7, which seems to point to the presence of a heavy resinous oil. (Simmon's Spice Mill, February, 1913).

## Coffee

Heavy sales have been made in the terminal market at steadily falling prices, but as early sellers have desired to close their contracts, there has been an occasional advance, the final rates being only 2*s.* 6*d.* per cwt. under last week's. The political and financial unrest in many parts of the world, and in addition the failure of a rather large dealer in Havre, have been the apparent causes of the sharp fall. Dealers generally expect lower rates during the coming season, and have mostly, therefore, refrained from buying. The decline in the terminal market has of necessity been reflected to some extent at the auctions, where heavier arrivals of new crop Costa Rica have been offered in larger quantities than are needed for immediate consumption. Prices have in consequence given way about 2*s.* for the finer grades and as much as 5*s.* for common sorts, and at the lower level there is much more inclination to buy. Probably as soon as it is realised that rates are now as low or lower than they have been twelve months, more business will be done, and as stocks are, by no means, heavy even a moderate demand may easily lead to a recovery.

LONDON COFEE RETURNS.

| | Home Consumption. | | Export. | | Stock. | |
|---|---|---|---|---|---|---|
| | 1913 | 1912 | 1913 | 1912 | 1913 | 1912 |
| For week ended Feb. 15 ... | Tons 284 | Tons 423 | Tons 314 | Tons 387 | Tons 10,762 | Tons 10,881 |
| For 7 weeks ended Feb. 15... | 1,839 | 2,047 | 1,734 | 2,526 | ... | ... |

—*The Produce Market Review.*

## SELECTED CUTTINGS.

### Keeping soft cuttings alive for long periods.

By GEORGE W. OLIVER, *Plant Breeder and Propagator, Office of Foreign Seed and Plant Introduction.*

It has often been found desirable to bring soft or herbaceous plant cuttings from long distances, but the difficulty heretofore attending their transportation has been that the cuttings do not remain in good condition longer than a day or two. This difficulty has been removed by an exceedingly simple contrivance.

Dormant hard-wooded cuttings and scions can be sent long distances by mail, as was demonstrated a few years ago in a collection of scions and bud sticks forwarded to Mr. William. S. Lyon, at that time in the service of the Government of the Philippine Islands. Not only did the material reach its destination in good condition, but some of it was repacked according to instructions and returned to Washington, where it was successfully grafted in the Greenhouses of the Department of Agriculture.

Soft or herbaceous cuttings, on the other hand, such as those of alfalfa, clover, and many other plants, cannot be sent long distances by Mail or Express, but they will survive a journey of six weeks in perfect condition if kept where they can be given light occasionally and attention is paid to supplying the water lost through evaporation. This treatment in the case of alfalfa and many other plants induces healthy root action during a journey of several weeks' duration.

The apparatus for successfully bringing cuttings of herbaceous plants from distant places is of the simplest nature. The necessary articles are a small quantity of living sphagnum moss, two sheets of strong glass, 5 by 7 inches or larger, and some string. The cuttings should be prepared in much the same way as though intended to be placed in a propagating bed.

Arrange the first layer of cuttings without too much crowding and with the upper surfaces of the leaves on the first piece of glass and on top of the cuttings, and place about 2 or 3 inches of living sphagnum evenly distributed over the cuttings. Place another layer of cuttings on top of this moss, with the under surfaces of the leaves next to the moss, so that all the available space will be covered, and on top of this second layer of cuttings place the second piece of glass. Press down firmly, remove the moss which protrudes beyond the edges of the glass, and tie together with stout twine.

The package now consists of two pieces of glass, 2 inches of pressed sphagnum moss, and two layers of cuttings, one between each piece of glass and the moss. By keeping the moss moist and giving all the light possible (direct sunlight is best, and it does not raise the temperature of the moss to an appreciable extent beyond that of the surrounding atmosphere), the cuttings are not in least injured, provided the material is free from fungus troubles. If the journey is long enough, say, of four to six weeks' duration, cuttings such as those of clover, alfalfa, doryonium, lotus, and many other plants will have rooted freely while closely pressed against the glass. During the time of rooting no attention is required beyond keeping the moss wet and exposing the cuttings to the light for a few hours each day.

With the moss only slightly dampened, scions and bud sticks of rare plants keep a very long time in good condition under the same treatment. (*U. S. Dept. of Agrl: Misc: Papers, Bureau of Plant Industry, Cir. No. 111*).

## Chlorosis in Plants.

An abstract of a paper by P. Maze, Rust and Lemoigne, on "Chlorosis in Plants induced by Carbonate of Lime," is contained in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for October, 1912.

In a previous number of this *Bulletin* (January 1912), reference was made to experimental work by Maze on the "Chlorosis of Maize," when it was pointed out that this yellowing of the leaves does not indicate a pathological condition but is physiological, resulting from very varied influences. The author was, however, able to certify that the absence of sulphur or iron, *per se*, is able to cause chlorosis in maize. Chlorosis has been generally attributed to the want of iron, and this has usually been remedied by the addition of the sulphate of iron. The response to this treatment suggested the question as to whether the cause is not the lack of sulphur rather than the lack of iron.

It is well-known that calcareous soils play an important part in producing chlorosis in certain plants, and Maze showed that the desulphuration of the soil through the formation of insoluble calcium sulphate as one of the causes of chlorosis.

Consequent on this, the three investigators referred to above have conducted wider enquiries into the cause of chlorosis as manifested in lime soils generally.

*Vicia narbonensis* was grown successfully in water cultures containing all the essential elements for proper nutrition. The solution contained no carbonates. When, however, calcium carbonate was added to the culture solution at the rate of 2 per thousand, the plants became regularly chlorotic after producing half a dozen normal leaves. Drops of a solution of ferric nitrate at 0·2 per thousand deposited on the discoloured leaves caused the appearance of chlorophyll after three days. Magnesium sulphate does not exert any action on this chlorosis. It is, therefore, the calcium carbonate that has produced the chlorosis by the withdrawl of iron.

The explanation of these facts is as follows:—In the solution supplied with the calcium carbonate, the iron is made entirely insoluble. Certain plants like maize possesses the property of absorbing it by means of the acid secretion of their roots (malic acid in maize). Other plants like lupin or *V. narbonensis* are incapable of utilising the unavailable iron and hence become chlorotic. A similar incapacity on the part of the sugar-cane may possibly explain the presence of unproductive patches in cultivated fields, such as these in Antigua, (where they are called 'gall patches', particularly since these affected areas are, in the special instance mentioned, confined to the limestone districts of the island. —*The Agricultral News.*

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The export trade in cocoanuts has been almost destroyed by a disease in Cuba, which has attacked the palms, so that the number exported has fallen in three years from 10,000,000 to 4,000,000 so reports Mr. Vice-Consul Cowan. A cocoanut oil mill at Baracoa, which formerly worked day and night, now operates only two days a week. The Commission which has been considering the disease appears to be of opinion that nothing can uproot the disease except the destruction of all the infected palms. As it takes five years for a cocoanut palm to come into bearing, the industry must for some time suffer eclipse.—*Tropical Life.*

### Dynamite in Tea Planting.

With regard to the articles which have recently appeared in our columns on the use of explosives in planting, a well-known Nuwara Eliya Planter writes:—"What I want to know is, in employing explosives for tea land, do we have to use them in every place where we want a hole? If so, it will work out very expensive, I am afraid, at 3,000 holes to the acre." The main object in using explosives in agriculture is to break up and fissure the subsoil, to bring it in contact with the air and warmth, to regulate moisture, and to make the valuable plant food in the subsoil available to growing crops. In the cultivation of field crops, or in tree planting, these conditions are necessary if the beneficial results of intensive agriculture are to be secured by the cultivator. In the matter of planting trees that grow to large proportions, like rubber, cocoanuts, cacao, and fruit trees, explosives are of considerable value, for, besides breaking up the subsoil and making it loose and friable, the explosions form cavities at the bore holes, or in any case loosens the soil so that it can be easily removed with a shovel, to allow of trees being planted in them. In the case of trees which are planted close, like tea, there is no necessity to fire a charge in every place a plant is to be put down. In the United States of America, where dynamite has been used in agriculture for some time now, such field crops, like maize, which are planted very much closer apart than tea, are raised over considerable areas of dynamited land with good and profitable results. In tea cultivation after the firing of the charges in the field has broken up the subsoil and hard pan, where such exists, the plants may be put down in the usual way, and in the shattered soil the roots will soon come in contact with the food and nourishment made available. Messrs. Curtis and Harvey, the well-known manufacturers of explosives, give the following particulars about the quantity of explosive to be used:—

| Depth of hole. | | | Charge. | |
|---|---|---|---|---|
| 2 | feet | ... ... | 1½ | oz. |
| 3 | ,, | ... ... | 2 | ,, |
| 3½ | ,, | ... ... | 3 | ,, |
| 4 | ,, | ... ... | 4 | ,, |
| 5 | ,, | ... ... | 6 | ,, |
| 6 | ,, | ... ... | 8 | ,, |
| 7 | ,, | ... ... | 11 | ,, |
| 8 | ,, | ... ... | 16 | ,, |

"By the firing of the shot the ground should be loosened to a distance from the hole equal to about twice its depth. That is to say, for a hole 2 ft. deep over a circle of 4 ft. radius, the result of the shot can best be ascertained by digging down a verticle section through a hole. A cavity the size of a man's head will be found at the original position of the charge, and from this cracks will be found radiating in all directions. The distance to which these cracks extend effectively is the radius of the charge. If this radius is much less than twice the depth is too great, if much more the charge is too heavy. The distance so determined is the radius of the shot, and holes should be put down at double this radius." In very wet ground it will be necessary to sink charges below 4 ft., otherwise this depth is exceptional.—*The Weekly Times of Ceylon.*

We are indebted to the columns of the *Ceylon Observer* for the following extract:—

### The Solubility of Basic Slag.

(By John Hughes, F. I. C).

In a paper on "Basic Superphosphate," read by the writer in April 1901, before the London Section of the Society of Chemical Industry, it

was pointed out that the statement that ordinary basic slag contained 20 per cent. of free caustic lime was obviously incorrect, because such an excess of lime would indicate wasteful method of manufacture, for lime was only added in sufficient quantity to remove the phosphorus and silica existing in the original from ore.

It was further mentioned that probably 2 or 3 per cent. was the utmost caustic lime usually present in commercial basic slag. Recent investigation by the writer tends to indicate that the existence of caustic lime, even in small proportion, exerts a most important influence in rendering the slag soluble in the 2 per cent. solution of citric acid, which, under the provisions of the Fertilisers and Feeding Stuffs Act, 1906, has been prescribed as the standard solvent for this material.

In the following analyses the figures represent the general composition, also the relative solubility in the above solvent :—

GENERAL COMPOSITION.

| | No. 1. | No. 2. | No. 3. | No. 4. |
|---|---|---|---|---|
| Fine powder passed through standard sieve 10,000 holes to square inch ... ... ... | 90'89 | 75'74 | 70'92 | 96'15 |
| Total lime ... ... ... | 51'85 | 48'10 | 46'45 | 41'97 |
| Phosphoric acid ... ... | 19'45 | 17'90 | 18'80 | 10'95 |
| Oxides of iron, Manganese, Magnesia, etc. ... ... | 23'75 | 27'20 | 37'45 | 30'07 |
| Insoluble Silicious matters ... | 4'97 | 7'80 | 7'30 | 17'01 |
| | 100'00 | 100'00 | 100'00 | 100'00 |
| Equal to Phosphate of lime ... | 42'46 | 39'08 | 41'04 | 23'91 |
| Containing Caustic lime ... | 3'06 | 2'50 | 1'43 | 0'22 |

Solubility in 2 per cent. Citric acid solution after agitation in bottle for half-an-hour.

| | | | | |
|---|---|---|---|---|
| Soluble lime ... ... ... | 42'77 | 40'76 | 37'52 | 26'12 |
| Soluble Phosphoric acid ... ... | 15'60 | 16'55 | 16'30 | 1'80 |
| Equal to Phosphate of lime ... | 34'05 | 36'13 | 35'58 | 3'93 |

It will be noticed that fine grinding *alone* does not ensure future solubility, for sample 4, which is the finest ground, shows *lowest* solubility: while sample 3, which is the coarsest powder, shows a very high solubility.

It is interesting to notice that the citric solution, though it fails to dissolve much of the phosphoric acid in No. 4, dissolves a very considerable proportion of lime, namely, 26'12 per cent. which probably explains why basic slag which yields a low solubility of phosphoric acid, nevertheless, supply a relatively large quantity of lime in a very finely divided state, and consequently if applied to soils devident in lime and decidedly damp and sour, may produce a very satisfactory improvement in the pasture at a relatively *small cost.*

It might be contended that the solubility might be due to the relatively high proportion of lime associated with a low proportion of silica; but such is not the case, for a sample containing 18'20 per cent. of silica and only 39'99 per cent. of lime showed a solubility of 35'36 phosphate of lime, though the grading was only 77'12.

It seems, indeed, quite natural that the presence of caustic lime causes the minute fragments of the slag to burst on the absorption of moisture, and thus mechanically materially promotes the subsequent solvent action of the citric solution, and that when caustic lime is not present the solvent action is very much less effective (79, Mark Lane, London, E. C. *Chemical News*, 24th January.)—*The Indian Planters' Gazette and Sporting News.*